
Promoting Mercury-Containing Lamp Recycling: A Workshop for Solid Waste Managers

Brought to you by the Lamp Recycling Outreach Project (LROP) Partners:

The Association of
Lighting and Mercury
Recyclers



The National Electronic
Manufactures Association



The Solid Waste Association of
North America



Funded By:

The U.S. Environmental Protection Agency



The Workshop . . .

Covers:

- Introduction to the Guide
- The Driving Forces in Favor of Lamp Recycling
- Establishing a Plan of Action
- Reaching the Influencers: The Solid Waste Industry
- Targeting Your Message
- Information for Technical Assistance

What we will cover....

- Overview of Hg (mercury) lamps
- Informational video
- Health and Environmental Issues
- Regulations
- Recycling
- Workplace Health and Safety
- Packing, handling and storage

LROP's Approach

- Increase recycling of Mercury-Containing Lamps from the current level of 23% . . . to 40% by 2006.
- Meet this goal through
 - Promotion and
 - Education

Solid Waste Managers: Messengers & Motivators

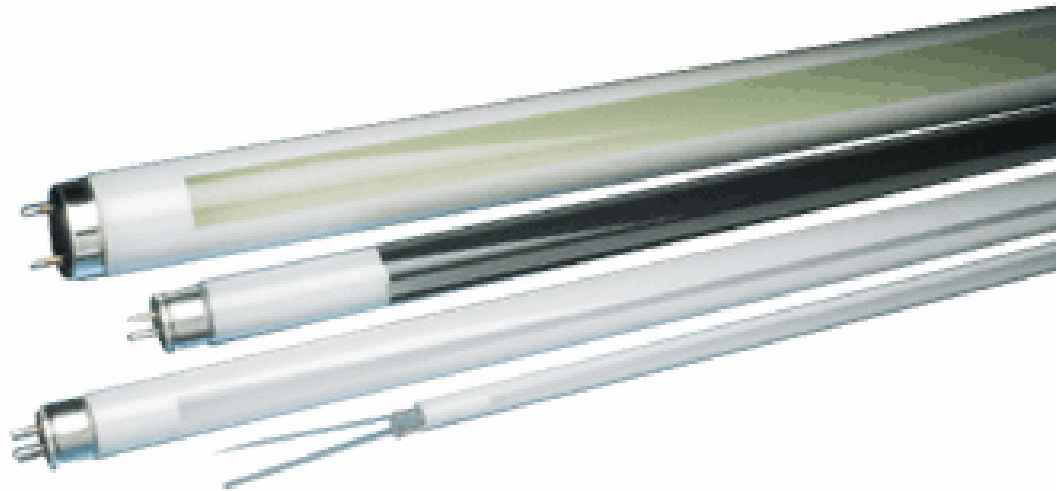
- Solid Waste professionals are uniquely qualified to educate and promote lamp recycling. They often:
 - Oversee solid waste operations where lamps are disposed
 - Promote other recycling activities
 - Are knowledgeable about Special Wastes
 - Have public outreach experience
- **The workshop was designed specifically for you!**

Overview of Hg Lamps

- Anatomy of Mercury-Containing Lamps
- How Mercury-Containing Lamps are Recycled
- Crushing

Anatomy of Mercury-Containing Lamps

Examples of Mercury Containing Lamps



Straight Tube Fluorescent Lamps

Anatomy of Mercury-Containing Lamps

Examples of Mercury Containing Lamps



Circline/Circular Fluorescent Lamp

Anatomy of Mercury-Containing Lamps

Examples of Mercury Containing Lamps



Compact Fluorescent Lamp

Anatomy of Mercury-Containing Lamps

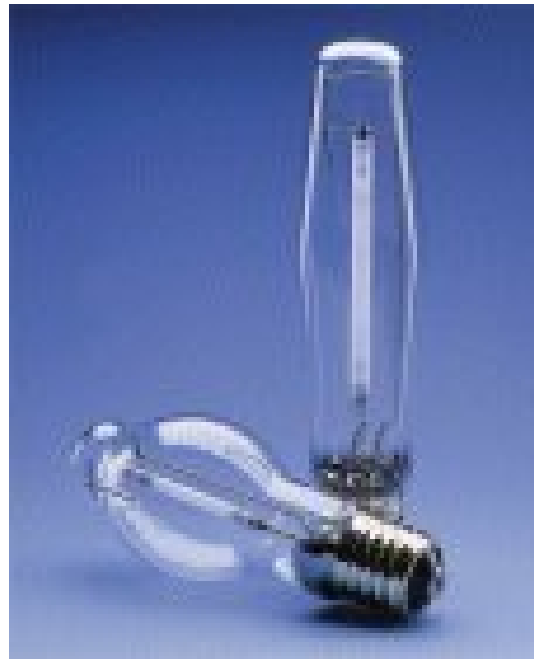
Examples of Mercury Containing Lamps



Compact Fluorescent Lamp

Anatomy of Mercury-Containing Lamps

Examples of Mercury Containing Lamps



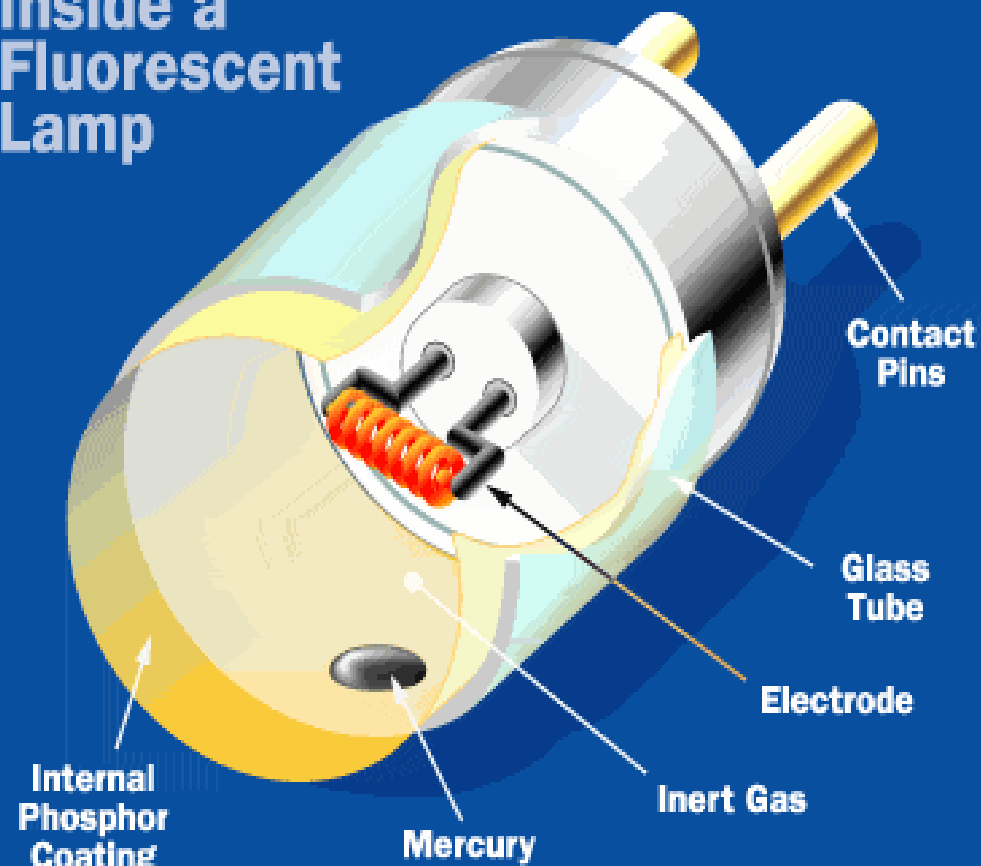
High Pressure Sodium

How a Mercury-Containing Lamp Works

1. Electrical charge
2. Electrodes energize mercury vapor
3. Causing it to emit ultraviolet (UV) energy
4. Phosphor coating absorbs UV energy, causing the phosphor to fluoresce and emit visible light.

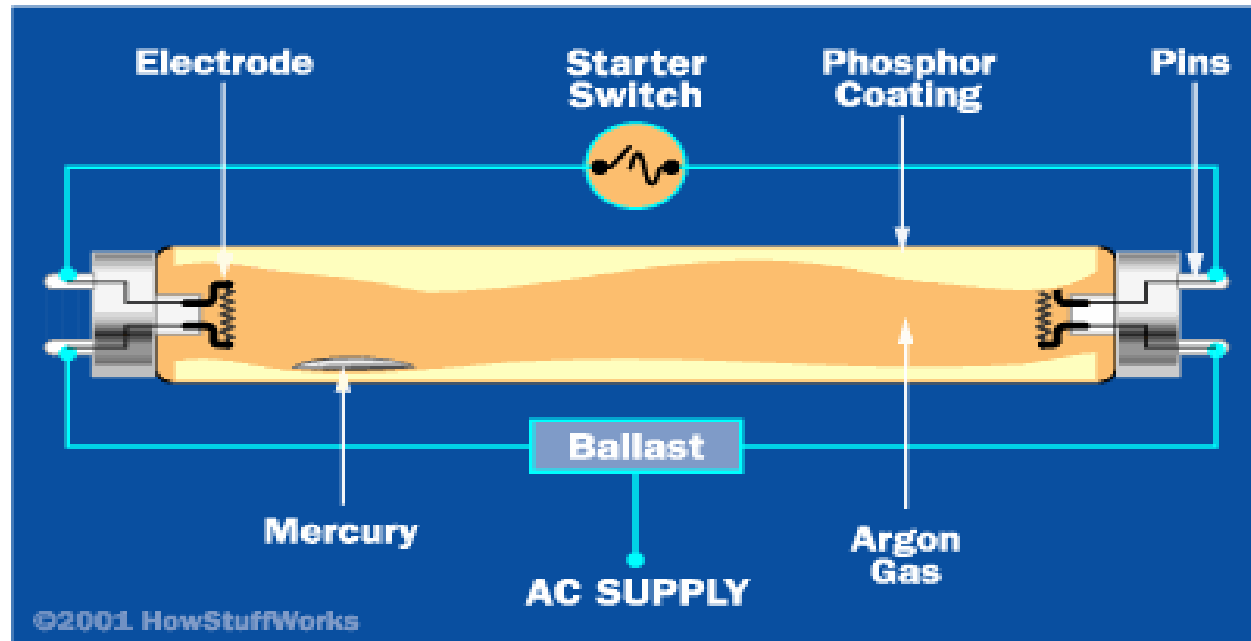
Mercury is in the form of gas inside lamp.

Inside a Fluorescent Lamp



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Fluorescent Lamp Operation



Lamp Recycling Process

WASTE FLUORESCENT LAMPS

LAMP CRUSHING DEVICE

COMPONENT SEPARATOR

Hg

Al

POWDER METAL GLASS

RECYCLE

**THERMAL
RETORT**

Hg (99.999%)

Calcium Phosphate

RECYCLE

Biggest Bang for Your Buck

- 85% of Mercury Containing Lamps are used by business and institutions
- To get the Biggest Bang for your Buck we recommend that you focus on lamps from these sources
 - Schools, municipal buildings, hospitals, hotels, and stores
 - Electrical, lighting and maintenance contractors

On the CD-ROM



You'll Find:

- Informational Video
- Links to Specific State information
- Database of Lamp Recyclers
- Specific Messages for a variety of audiences

Driving Forces for Lamp Recycling

- Reasons for lamp recycling:
 - Environmental & Health Issues
 - Government Regulations
 - Lamp Recycling Makes Economic Sense
 - Lamp Recycling is Easy

Let's go through each of these . . .

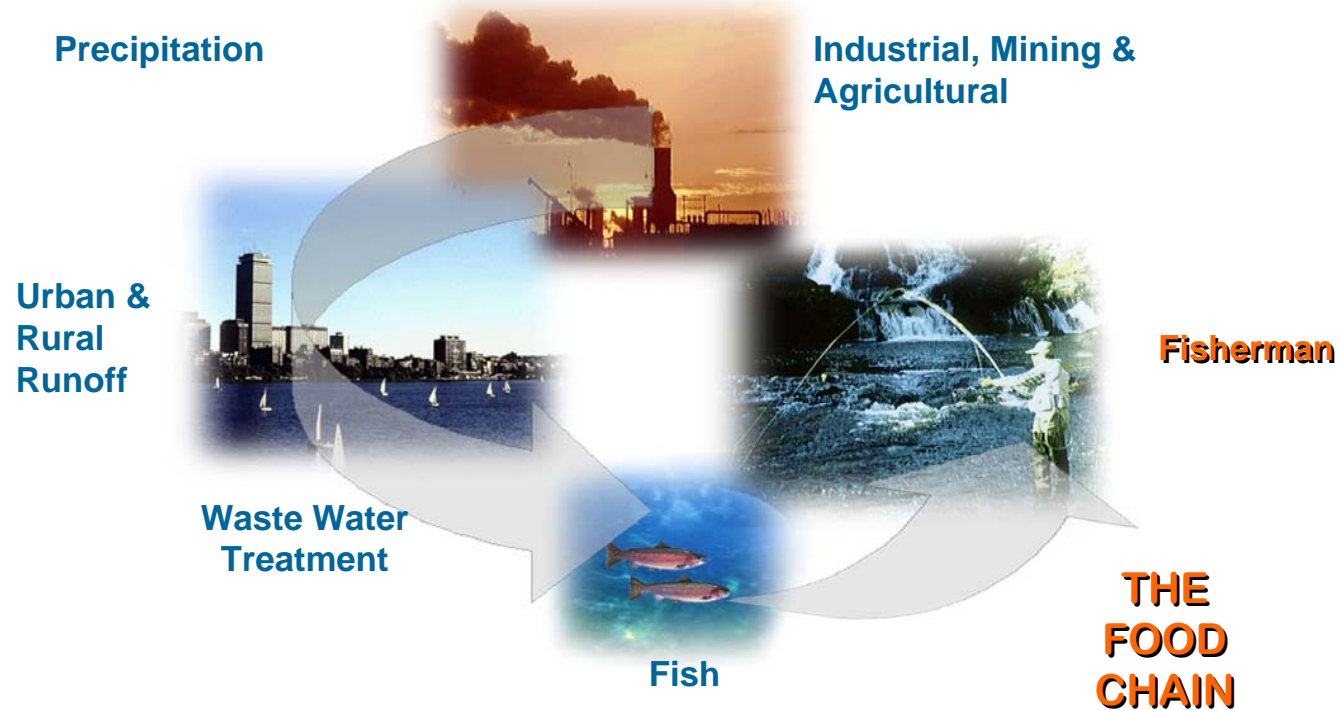
Environmental & Health Issues

Each fluorescent lamp contains small quantities of mercury

Even lamps with green end caps contain mercury

<u>Lamp</u>	<u>Avg. Amount (mg)</u>
Typical - 4' lamp	~ 8
Compact Fluorescent	~ 4 to 5

Mercury Bioaccumulates : The Mercury Life Cycle



Human Health Effects

High Exposures of Mercury may cause:

- Trembling hands & numbness or tingling in their lips, tongues, fingers or toes
- Fatigue, joint pain & mental instability
- Speech, hearing problems



Health Impacts from Lamps

- Nearly 530 million spent mercury containing lamps are put in trash each year
- NJDEP study estimated that 2 - 4 tons mercury released into the U.S. environment annually from broken lamps in MSW

Mercury Lamp & TCLP Test

Many spent mercury-containing lamps fail the Toxicity Characteristic Leachate Procedure (TCLP) Test

Therefore, these lamps are considered hazardous waste (unless otherwise exempted by State or Federal Law)

Federal Statutes for Lamps

LAW: Resource Conservation & Recovery Act (RCRA) Major federal solid & hazardous waste law

REGULATIONS: Subtitle C of RCRA Regulations

- Imposes strict regulations for disposal of hazardous waste
- Code of Federal Regulations (CFR) 260-279

The Universal Waste Rule

- Part of Subtitle C
 - Code of Federal Regulation (CFR) 273
- Creates alternative to hazardous waste handling when lamps are RECYCLED!
(in addition to batteries, thermostats and pesticides)
- Kansas has adopted the Universal Waste Rule

How Does the UWR Simplify Disposal Options?

- Exempt from HW Manifesting
- No costly analytical testing/reporting required

How Does the UWR Simplify Disposal Options?

- May use common carrier instead of certified hazardous waste hauler for shipment to recycling (destination) facility
 - Bill of Lading acceptable
 - Significantly lowers costs

How Does the UWR Simplify Disposal Options?

- No permit required to store lamps (update operating plan)
- May store any amount up to one year

How Does the UWR Simplify Disposal Options?

- Minimal training requirements
- Minimal labeling requirements

Universal Waste Lamps

Accumulation Start Date _____

Laws and Regulations: Bottom Line

Regardless of how you choose to manage your waste
you must be thoroughly acquainted with both state and federal regulations!

Kansas Regulations

- Adopted Universal Waste Rule
- Spent Fluorescent Lamps Containing Mercury TGD HW 95-1
 - Requirements
 - Non-Generators of Hazardous Waste and SQGs
 - Kansas Generators and EPA Generators

Kansas Non Generators & SQG

- < 100 four foot lamps are generated or accumulated in a calendar month (approximately 55 lbs)
 - May be managed as other routine solid wastes

- > 55 lbs (more than 100 four foot lamps)
 - Must be managed as as hazardous waste or as universal waste

Kansas and EPA Generators

- Generator is responsible to determine if the waste is hazardous
 - TCLP analysis for mercury
 - Fail - managed as hazardous waste or universal waste
 - Pass - can be managed as solid waste
 - Knowledge from manufacturer (reduced quantity of mercury – not hazardous waste)

Cost Recycle Lamps

- Costs depend on a number of factors:
 - Type of lamps
 - Quantity being recycled
 - The services provided
 - The distance of transportation
 - The type of collection provided

Recycling Mercury-Containing Lamps is Easy

- Modern facilities & programs exist to safely contain and recover mercury from lamps



Lamp Recycling

- Smaller users:
 - “box program”
 - container is provided and when full it can be sent to any recycler via ground mail shipment.
 - prepaid program and
 - labels and shipping papers are provided.



The Bottom Line

If the lamps are not recycled
or handled as a hazardous waste
they are ending up in your
solid waste system



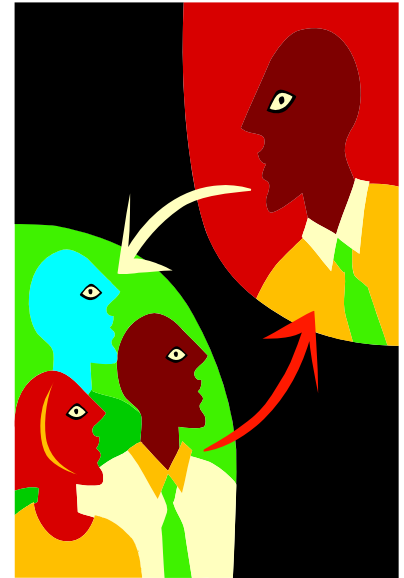
The U.S. Environmental Protection Agency, Association of Lamp Manufacturers & Recyclers, the National Electronics Manufacturers Association, and the Solid Waste Association of America encourage that *all* mercury-containing lamps are recycled.

Generator Program Considerations

- Staffing
- Basic Compliance with Regulations
- Employee Training
- Response to Breakage
- Packaging for Return Shipment
- Labeling
- Storage Area
- Recordkeeping
- Selecting a Recycling Vendor

Considerations - Staffing

- No new staffing required
- But new responsibilities for existing staff
 - Putting lamps in recycling containers rather than in trash
 - Avoiding intentional breakage
- Be prepared to provide technical assistance



Basic Compliance with Regulations

- Employee Training
- Response to Breakage
- Packaging
- Labeling
- Conditions for storage (accumulation) area
- Signage storage area
- Accumulation limits
- Recordkeeping

Employee Training

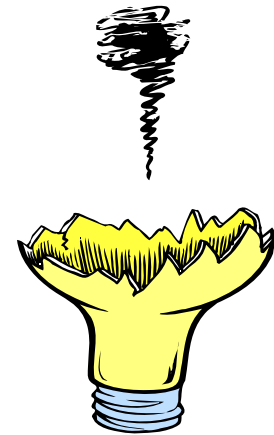
Must inform all employees who handle, or have responsibility for managing lamps, about proper handling & procedures for damaged mercury-containing lamps

Communicate in two ways

- .Training session with demonstrations & opportunity for questions, answers, & hands-on practice
- .Written materials

Breakage

- “Incidental” breakage expected
 - 5% or less. For every 100 lamps recycled, might expect 5 or fewer to accidentally break.
- Intentional breakage is prohibited




Workplace Health & Safety

Handling of Small Numbers of Broken Fluorescent Lamps

- Close off the room to other parts of the building.
- Open a window(s)
- Leave the room for at least 15 minutes.
- Carefully scoop up the fragments with a stiff paper (do not use your hands)

Workplace Health & Safety

Handling of Small Numbers of Broken Fluorescent Lamps

- Wipe the area with a disposable paper towel to remove all glass fragments.
- Do not use a vacuum as this disperses the mercury over a wider area.
- All fragments should be placed in a sealed plastic bag and properly disposed of.
-  For proper disposal instructions, see “Message for Environmental Groups.”

Workplace Health & Safety

Universal Waste Rule Requirements

- Failure of TCLP Test
- Placed in Closed Container.
- Lacking any Evidence of spillage.
- Rebecca Wenner, Compliance and Enforcement Unit Chief (785) 296-1604

Packaging

A small or large quantity generator of UW must store lamps in containers that are:

- Structurally sound
- Adequate to prevent breakage
- Compatible with the contents of the lamps

Containers must remain closed & must lack evidence of leakage, spillage or damage that could cause leakage under reasonably foreseeable conditions

Containers that can meet these criteria include:

- Original boxes
- Another cardboard box
- Fiberboard drums

Sample Packing & Handling Instructions

- *Never* tape lamps together or use rubber bands.
- Packing materials not needed to separate lamps, but containers should be filled before shipping or put loose packing material to secure them.
- Tape bottom of boxes & when full tape securely closed.

Sample Packing & Handling Instructions

- Do *not* over-pack. As soon as you think container is full – it is. On average, 4' box holds 30 – 35 T-12s, drum holds 85 T-12s, 8' box holds 15 – 17 F-96s.
- Do *not* place heavy objects on boxes or drums.
- Label each container with **Universal Waste–Mercury-Containing Lamp** label. Write date you place first lamp in container on the label.

Sample Packing & Handling Instructions

- U-tubes, circlines, small lamps or other non-straight lamps, use any sturdy cardboard box. Wrap one sheet newspaper around lamp or put in original casing.
- 4' boxes/drums hold any straight lamp 4' or less. 8'boxes/drums any straight lamp between 4' & 8'
- If lamp breaks in box/drum – leave it alone. Do not try to remove broken lamp or parts from container. **If it seems that lamps in a sealed box or drum have broken – leave it alone. Make a note on container that lamps have broken & send to recycler.**

Lamp Crushing

- Lamp crushing is controversial
- Drum-Top crushers are being sold but the UWR currently considers this as “treatment”
- Those who treat are subject to full subtitle C hazardous waste requirements.
- EPA conducting a study to determine national standards for drum crushing.

Labeling

Each container must be labeled with one of following phrases:

- Universal Waste - Lamp(s)
- Waste Lamp(s)
- Used Lamp(s)

And, must include 1st date of accumulation

Universal Waste – Lamps

Accumulation Start Date: _____

Storage Area

- Need a dedicated storage area for lamps
 - ◊ In area that is secure
 - ◊ Dry with good ventilation
- Factors to consider in selecting site:
 - ◊ Types & size of containers & where will be placed
 - ◊ How much material will be stored between pick-ups
 - ◊ Convenient for employee & recycler access

“Don’ts & Do’s”



Improper Storage



Proper Storage

Signage for Storage Area

CAUTION

Waste Mercury-Containing
Lamp Storage Area

Selecting a Recycling Vendor

- Resources for potential vendors:
 - www.lamprecycle.org
 - www.almr.org

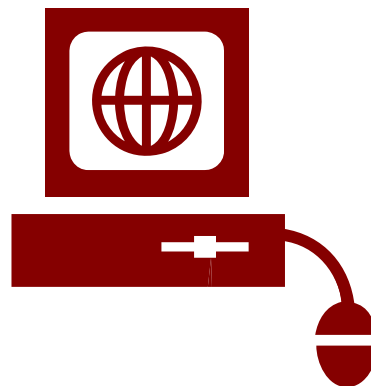
Type of Pick-Up Service

- Mail-in
 - ◊ Ideal for very small quantities
- Self-transport
 - ◊ Recycler nearby

Conclusion

- Understanding of Mercury containing lamps
- Understanding of UWR
- Consider a lamp recycling program
- Consider lamp recycling outreach

For More Information



- NEMA www.nema.org
- ALMR www.almr.org
- SWANA www.swana.org
- Rebuild America www.rebuild.org

Please recycle!



**Do your part to keep
mercury-containing
lamps out of the
environment.**



KP1

Slide 57 -- Please recycle: Agree with Joe Howley's suggestion to limit ballast reference to PCB ballasts.
Kathleen Peake, 6/20/2002